Technical Manual

the right clutch shifter lever to the outside. This disengages the clutch and allows the right hand cats to free wheel when power is applied as described under Propelling. The opposite applies in turning to the left using the left clutch shifter lever.

2. In order to use the locked steering it is necessary to move the steering clutch manually so that it engages with the locking jaws which are welded to the cat side frames. The clutch lever should be pinned to the clutch guard before starting to propel. To disengage the clutch it may be necessary to relieve the load on the jaws by momentarily reversing the controller. When steering the machine with either clutch in the locked position, the ground man must be very careful so as not to allow the side frames to ride over or turn into a rock which may be projecting up from the floor of the quarry. To do so would place dangerous stresses in the links and side frames.

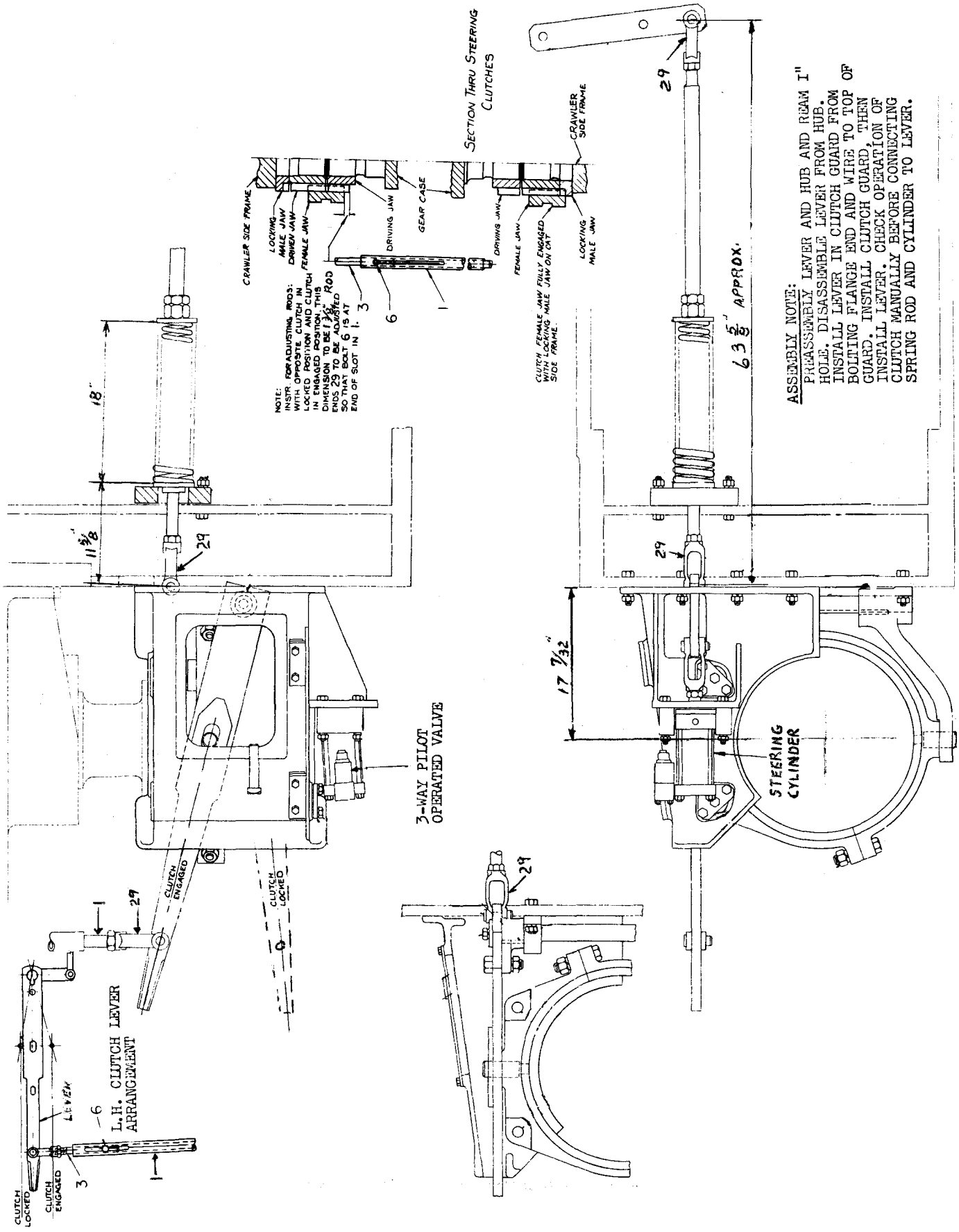
DRAGLINE OPERATING HINTS

Actual digging operations with the dragline require coordination between the hoist and drag motions which may be a little difficult to attain. Attention to the following suggestions and a little practice will soon give the operator the knack of filling the dragline bucket smoothly and quickly and permit accurate dumping.

1. Keep the boom angle as high as conditions will permit so as to provide maximum stability. Do not exceed figures given in the machine specifications.
2. Regulate the depth of cut by taking in or paying out hoist line.
3. Hoist the bucket out of the pit as soon as it is full and before dirt is pushed up against the machine.
4. Start and stop the swing motion slowly so as not to place unnecessary strain on the boom.
5. When dropping back into the pit be careful to check the hoist and drag drums with the controllers so that the cables do not run off the drums.

To stop machine press "Emergency Stop" button on control panel. This cuts off all D.C. current to brakes, rotating control units and clutch magnet valves. Thus all brakes are applied and controls made inoperative. Be sure to return controls to neutral.

To stop Motor-Generator Set depress button marked "MG Stop" on control panel.



STEERING MACHINERY

190-B, 195-B Ref. 870695 3-73

Collector rings of wound-rotor and synchronous motors must be kept clean and polished. Ordinarily the rings will require only occasional wiping with a piece of canvas or non-linting cloth. If the rings become worn or pitted so that excessivc sparking occurs, grind or turn them to restore a smooth and true surface. Be sure all dust and dirt is blown out of the spaces between the collector rings.

Collector ring brushes must move freely in the holders and make firm contact with the rings. Check the brushes frequently to see that they are not stuck in the holders. New brushes should be ground to perfect fit with fine sandpaper. Maintain the brush spring tension at a pressure of from 2 to 3 pounds per square inch for carbon or graphite brushes. When replacing worn brushes, use the correct grade as furnished by Bucyrus-Erie Company.

Induction motors of small and medium size are usually furnished with ball or roller bearings. Induction or synchronous motors of the larger sizes may have oil-lubricated sleeve bearings.

Actual lubrication requirements of any particular motor or generator vary to a great extent on the details of construction, therefore it is impossible to give detailed lubrication instructions which will apply to all motors and generators. Manufacturers bulletins covering the electrical equipment are included with the instructions furnished for the machine. Read the bulletin applying to the particular piece of equipment for detailed maintenance instructions.

Couplings

The couplings used for connecting separate units of the motor generator set may be either of two general types, depending upon the construction of the motor generator set. Flexible couplings are usually used where both units to be connected have shafts supported at both ends. Solid (or rigid) couplings are used where one or both shafts are supported at one end only.

Solid couplings are of the flanged type and consist of two steel members rigidly bolted together. One half has a projecting ring on the face of the flange and the other half has a corresponding recess in the face of the flange. The fitted bolts holding the coupling halves together permit no flexibility, therefore the coupling halves must be very accurately aligned when assembling the coupling. The coupling was correctly installed at the factory but because of possible distortion in the supporting base, resulting from handling or from settling of the machine framework, it is well to check the alignment after the machine first goes into service and at increasingly greater intervals thereafter until it is definitely established that the alignment has not changed.

The first step in checking alignment of a motor-generator set consisting of two or more units all coupled with solid, flanged couplings, is to loosen all bolts and remove all but two diametrically opposite bolts in each coupling. Next, use jacking bolts to force the coupling halves far enough apart to permit inserting feelers between the coupling faces. Always open up the couplings next to the two-bearing unit (usually the driving motor) first, and do not open up the couplings too far, because the total end play must be divided between the couplings. After opening all couplings, remove the jacking bolts from all couplings and check alignment starting with one of the couplings next to the two-bearing unit.

Check the coupling halves for parallel faces by measuring the gap between halves with feeler gauges. Measure the gap at four points spaced 90 degrees apart around the coupling, then turn both shafts ¼ revolution and again take the four gauge measurements. Repeat this procedure two more times, turning the shafts ¼ revolution each time, taking care to turn both shafts the same amount, so that the relative position of the coupling halves is not disturbed.

The measurements on the sides of the coupling should check within 0.002 in. for all positions but the top and bottom readings may show a constant difference due to the tendency for the shafts to drop slightly at the open coupling.

Correction of vertical misalignment is obtained by adding or removing shims under the frame feet. Correction sidewise is obtained by removing the dowels, loosening the foot bolts and tapping the feet until the desired movement is obtained. Tighten the foot bolts before rechecking the alignment. After correct alignment is obtained drill new dowel holes and insert the dowels.

The flexible couplings used may be any of several different types depending upon the manufacturer of the motor generator set.

The "Fasts" flexible coupling, used on some sets, is not a universal joint and the same care must be taken in alignment of the coupling as for the solid coupling. In addition to checking the gap between coupling halves, check the hubs for concentricity by placing a straightedge on the rims of the hubs. Insert shims, if necessary, so that

Keep the motor clean and free of dirt and oil by following the general instructions given for alternating current motors.

If the compressor does not pump the required amount of air without running excessively, check the air piping for possible leaks. If the cylinders lack compression, examine the condition of the valves and clean, if necessary, as described in the manufacturer's bulletin. CAUTION: DO NOT ATTEMPT TO REMOVE THE DISCHARGE VALVE CAPS UNTIL THE AIR HAS BEEN BLED FROM THE SYSTEM.

The motor starting switch is provided with thermal overload relays to protect the motor against overheating. If the overload relays continually open the magnetic switch, examine the compressor for hot bearings or stuck valves. DO NOT REPLACE THE RELAY HEATERS WITH HEATERS OF LARGER SIZE.

Short circuit protection is obtained by the use of a circuit breaker or fuses in the supply line. Other motors may be connected to the same circuit breaker; therefore, in case the breaker opens, investigate all circuits to determine the cause of the trouble before resetting the circuit breaker or replacing the fuses.

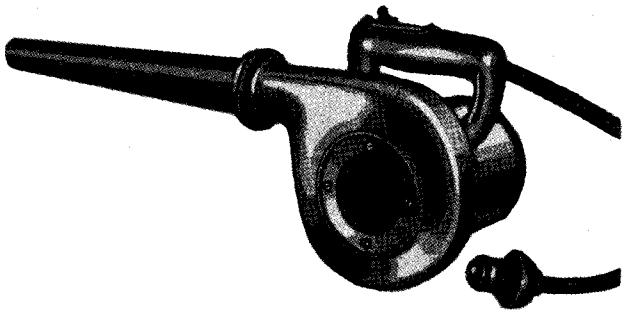
The Care of Motor and Generator Insulation

The following instructions regarding the care and maintenance of motor and generator insulation are of the utmost importance and should be followed very carefully in order to obtain the best results and continuous service from your machine. In the care of electric motors and generators, the feature having the greatest influence on operation, life and general well-being is the care given insulation.

Motors and generators that have been long in transit in moist atmosphere, or have been idle for an extended period without heat to prevent the accumulation of moisture, should be thoroughly dried out before being placed in service. Machines may also become wet by accident, or they may "sweat" as a result of a difference in their temperature and that of the surrounding air, just as cold water pipes "sweat" in warm, humid atmosphere. This condition is very injurious and should be prevented, particularly in the case of large and important motors and generators, by keeping them slightly warm at all times. Current at a low voltage can be passed through the windings or electric heaters can be used with tarpaulins stretched over the motor or generator to maintain the proper temperature.

A systematic and periodic inspection of motors and generators is necessary to ensure best operation. Some machines are installed where conditions are ideal, where dust, dirt and moisture are not present to an appreciable degree; but most motors are located where some sort of dirt accumulates in the windings, lowering the insulation resistance and cutting down creepage distances. Stone or coal dusts are highly abrasive and actually cut the insulation in being carried through by the ventilating air. If conditions are extremely severe, open motors and generators may require a certain amount of cleaning each day. For less severe conditions weekly inspection and partial cleaning is sufficient. Most machines require a complete overhauling and thorough cleaning about once a year.

The best method for cleaning the insulation is air at low pressure. The Bucyrus-Erie Company offers a portable blower delivering a good volume of air at the correct pressure which is very convenient for the periodic cleaning of insulation.



Once each week, or oftener if required by extremely dusty conditions, blow out the accumulated dust and dirt in the windings. Oil or grease is extremely detrimental to the insulation and must not be allowed to remain on the windings. Wipe off any accumulation of grease and clean with carbon tetrachloride. Be sure there is good ventilation, because the fumes are dangerous.

If small cracks appear in the insulation, apply a coat of insulating varnish after thoroughly cleaning the winding. Suitable varnish for this purpose may be obtained from the nearest dealer or the electrical equipment manufacturer. On most motors and generators, windings are accessible, and the air can be properly directed to prevent damage to them.

for the vernier setting of hoist reference current. 11RH is the vernier setting for lower reference current. Care should be taken to have at least one-half of 10RH and 11RH in the circuit at all times.

H. Press push button EMS to de-energize EMC.

2. Set bias voltage and check exciter polarity. (These tests are to be performed with the M.G. sets stopped.)

A. Open auxiliary power circuit breaker. Reconnect wires HK1, HK2 and HK4 to the hoist panel. Remove the current limit fuse, thus opening the main power circuit. Close the circuit breaker feeding the regulator transformer.

B. Check the D.C. voltage between terminals 22 and 23 to 25 on the firing circuit module located on each regulator panel. This voltage should be 40 to 55 volts.

C. Open the auxiliary power circuit breaker. Replace the current limit fuse in the hoist regulator power supply wire. Place a voltmeter across each generator field (terminals PL-F to NL-F and PL-R to NL-R on the regulator panel). Jumper the EMC contact in the ECC coil circuit, wires AL5 to AL6.

D. Close in the auxiliary power air circuit breaker to energize the regulator transformers.

E. Immediately check the voltage across each of the generator fields. If this voltage is 3 volts or under, leave the breaker on. The voltage across each generator field should be balanced at approximately 3 volts at the factory and should only have to be checked in the field. Adjust 8RH (forward amplifier) and 9RH (reverse amplifier) for the C-143 specified field voltage. Increasing resistance increases generator field volts.

WARNING: Do not energize the regulators and leave them without immediately checking the generator field voltage because if the bias circuit is improperly wired or improperly set, the amplifiers will go to maximum output and burn out the generator fields.

F. Open the auxiliary power breaker and remove the jumper, wires AL5 to AL6.

2. Install the fuse and then energize EMC. If the rotation is incorrect to take up the trip cable, reconnect the motor as noted on the schematic diagram. The operation, when crowding or retracting, should be as noted in No. 1 under general.

   a) If it is necessary to increase the torque to keep the trip cable tight, move wire DG4
   b) Tc decrease the torque, move wire DG4 towards wire DG5.

   NOTE: Wire DG4 should not be moved off of the 8.5 ohm reisitors.

3. Attempt to trip the dipper by actuating the trip latch switch with the bucket stationary. The results should be as noted in No. 2 under general.

   a) If additional torque is needed, move wire DG5 toward wire DG3.

   b) If it appears that less torque would be sufficient to trip the dipper, move wire DG5 toward wire DG4.

   NOTE: Wire DG5 must not be moved off of the .5 ohm resistor.

4. If it is not possible to obtain sufficient torque in either 2 or 3 above, short out some of the resistance between DG4 and DG5 (approximately 1/2) and repeat Steps 2 and 3 to obtain the desired results.

PROPELLAIR DIRECT DRIVE FANS, TYPE CD, QD, DT, AND DV
INSTALLATION AND MAINTENANCE INSTRUCTIONS

Installation

1. Before mounting fans, check all motor hold-down bolts and propeller set screws to ensure that they are tight.

2. Make sure propeller is free to rotate without binding.

3. Type CD and QD fans are normally mounted by means of bolt holes in the outlet flange. Type DT and DV units are mounted by either or both flanges, and/or mounting feet when provided.

4. Connect motor leads for line voltage as indicated on instruction plate secured to motor or located inside terminal box cover. Motor should always be protected with circuit breakers or fuses against accidental overload or line voltage trouble.

5. If automatic shutters are to be used with CD or QD fans, optimum service will be obtained if the shutters are spaced from fan as follows:

Fan size	Minimum spacing
16" - 30"	3"
36" - 42"	6"
48" - 72"	8"

Maintenance

1. Check propeller periodically for accumulated dirt and clean if necessary. Accumulated dirt on the propeller changes the airfoil section of the blades with a resultant loss in efficiency. It also may cause the propeller to become out of balance causing undue radial loads on the motor bearings.

2. Check all bolts and set screws periodically to ensure that they are tight.

3. Robbins & Myers motors are equipped with double shielded, prelubricated, bearings and under normal operating conditions will need no attention.

4. When ordering spare or replacement parts such as propellers and bearings, please give all available information. This should include all information on both fan and motor nameplates as well as any identifying numbers appearing on the part being replaced.

X-2423

ing the same period and, in fact, one type may be the cause of another type. For example, pitch-line pitting may progress to such an extent that overloads are created at the edges of the roughened areas. As a result, subsurface fatigue and, ultimately, spalling occur. In other words, pitting may lead to spalling. In other instances spalling and galling may be present, showing both metal-fatigue and lubrication failure. As noted previously. abrasion may be caused by metal particles that were spalled, pitted or gouged from tooth surfaces, and scratching may be preceded by severe pitting or galling. Combination failures must be carefully studied together with mechanical and operating conditions in order to determine the most probable initial cause of failure.

WORM GEARS

Pitch-line pitting as previously described does not occur in worm gears. Because of greater slide in these gears than in spur or helical gears, the tendency is for surface inequalities to be worn away before metal fatigue occurs. Tooth-surface failure by abrasion or scratching can occur the same as in gears of other types, but the most commonly encountered worm-gear failures are of the spalling and galling types.

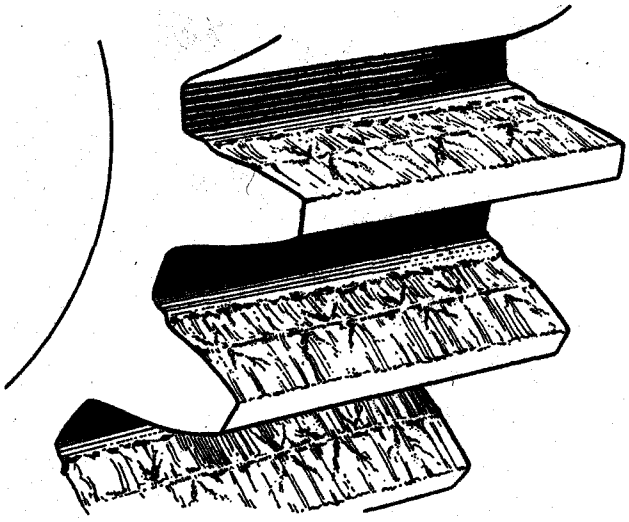
Heavy loads on worm gears may subject relatively large areas of tooth surface to stresses that cause subsurface fatigue and the eventual spalling of relatively large flakes of bronze. Spalling of this type is often called "worm-wheel pitting."

Spalling on worm gears is frequently heaviest on the end of the tooth leaving mesh. Spot temperatures in this area are higher than elsewhere, and it is probable that the fatigue resistance of the bronze is lowered as a result. In some instances, localized spalling may be caused by misalignment.

Lubrication failure in worm gears—either because of unsuitable oil, incorrect oil application, or excessive load—may result in galling. Where load is excessive so that either spalling or galling can be expected, the type of failure that occurs seems to be influenced by the grain structure of the bronze.

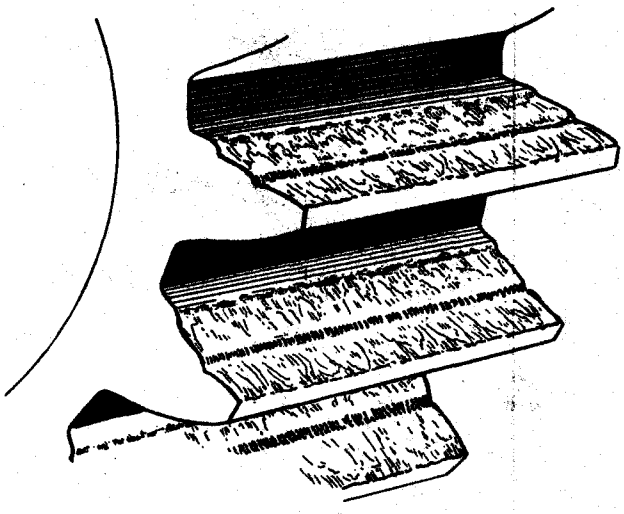
HYPOID GEARS

Where hypoid gears are involved, surface failures on teeth may take several different forms.



DRIVEN GEAR

Fig. 8 . . . *Severe Galling*. The direction of slide on the teeth of a driven gear is always toward the pitch line. Thus, where simple galling occurs, the movement of metal is always toward the pitch line. Eventually this plastic flow of metal creates a hump or ridge across each tooth.



DRIVING PINION

Fig. 9 . . . *Severe Galling*. On a driving gear (pinion) the direction of slide is always away from the pitch line. Thus where simple galling occurs, the plastic flow of metal tends eventually to create a hollow or groove across the face of each driving tooth.

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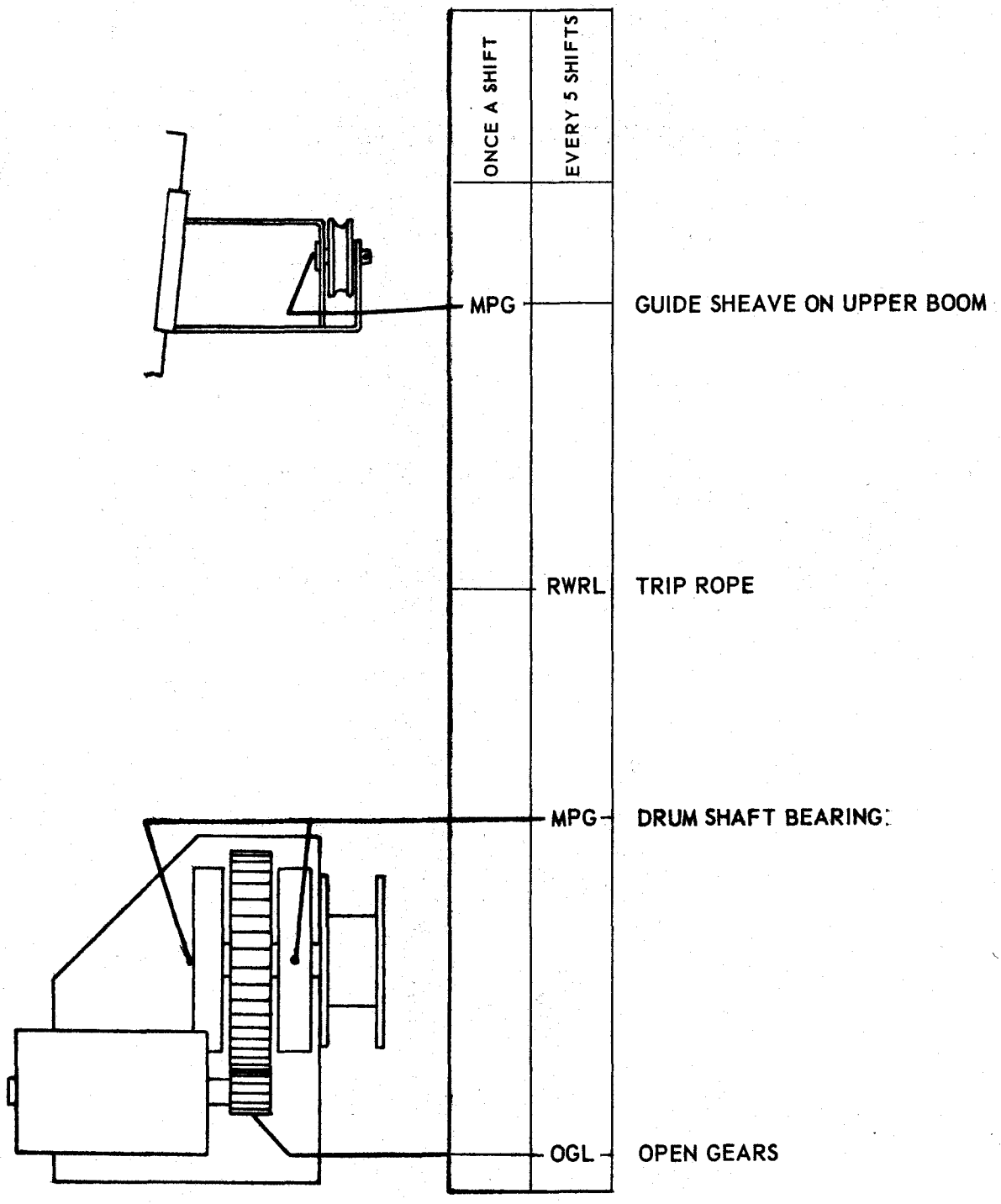

REEL TYPE DIPPER TRIP

REV. OCT. 1967
REF. DWG. 809842

SCOPE:

Lubricant performance requirements for Multi-Purpose Oil.

APPLICATION:

The addition of a lubricant to the compressed air system, hand oil cans etc.

GENERAL REQUIREMENTS:

1. Must be fluid at temperature applied
2. Should contain rust inhibitor
3. Motor oil - API service classification "MS".

VISCOSITY RECOMMENDATIONS:

1. Air Line Lubricant

Ambient Temperature	SAE Number
Below - 10°F	5W
Above - 10°F	10W

2. Hand Oil Can

Viscosity to be suitable for application and temperature.

These performance requirements are benchmarks and not a specification. Therefore meeting these limits as described above does not relieve the supplier of the responsibility associated with brand name products.

SCOPE

Lubricant performance requirements for Roller Circle Rail Lubricant.

APPLICATION

Between the mating surface of the rollers and rails, and between the roller flange and rail.

METHOD OF APPLICATION

1. Heated and either poured or hand sprayed on the rollers and rails.

2. Sprayed or dripped on the rollers and rails by means of an automatic lubrication system.

3. Applied by means of cartridge gun.

GENERAL REQUIREMENTS

The following are the requirements of the lubricant at the ambient temperature at the roller circle rail.

1. Adhesive - maintain film lubricity and be highly resistant to squeeze at contact points of mating surfaces.

2. Flexibility - the coating on the surface of the roller circle rail must remain pliable.

3. Extreme pressure - must withstand the high rolling contact pressures and have the ability to flow under loads.

4. Consistency - should maintain consistency.

5. Water resistance - ability to resist water washout.

TYPES OF LUBRICANTS

1. Petroleum Resin and Asphaltic types

   a. Hot Melt Type

      Since this type must be heated and melted before it is applied to the rails, safety codes should be checked before it is used.

   b. Diluted Type

      This should contain a fast drying diluent such as or equivalent to Trichloroethelyne. The diluted viscosity must be such that the lubricant can be applied by either spraying or dripping at the ambient temperature at the roller circle rail.

Quite often, when hand operated systems are being tested after installation, repeated operations of the system are made and sometimes the interval between cycles is short, resulting in the subject difficulty. It should be remembered that under normal conditions the cycling of a hand operated system will usually be infrequent (once an hour at the most), allowing plenty of time for proper venting.

FAILURE OF THE PUMP TO BUILD PRESSURE

This difficulty is in evidence when repeated operation of the pumping unit fails to produce line pressures sufficient to cause the system to cycle.

Correction

First check to see that there is a supply of lubricant in drum or reservoir.

The majority of these cases are traceable to the air locks in the pump and the familiar corrective measures are effective. However, the trouble may be caused by the failure of the pump outlet checks to hold the pressure, developed on each plunger stroke, in the supply line while the plunger moves backward preparatory to the next stroke. Usually the malfunction of the check seats is caused by the presence of foreign material which prevents the ball or check from seating securely. The disassembly and thorough cleaning of the check seat should correct the difficulty.

DIRTY LUBRICANT

All lubricant used in the Centro-Matic systems should be clean and fresh. However, faulty storage and handling methods will frequently cause foreign material to contaminate the lubricant. All individual machine "pumping units that include a reservoir" are equipped with a screen covering the inlet port to the reservoir, which should prevent foreign material from entering the working mechanism.

Correction

The use of the 1823, 1824, 1826, 1827, 1836, and 1837 Models enables the user to pump the lubricant from the original container, eliminating the costly and dangerous transferring of lubricant. The manual operated pumps, single stroke pumps and electro-lubers incorporate a buttonhead filler fitting which, with the #81834 filler pump, enables the user to fill the container without the use of paddles or other antiquated transfer methods.

ROPES - GENERAL

In designing a machine, Bucyrus-Erie makes careful studies of the size and operating speeds of all sheaves and drums and then selects the correct wire rope for each service. Constant contact with many machines in the field and repeated consultation with many rope makers helps us in selecting rope that is most satisfactory for each of our machines. To maintain this part of machine at its highest efficiency, purchase new ropes directly from Bucyrus-Erie Company and obtain the rope which we have found to be most suitable for that particular application.

OPERATION AND MAINTENANCE OF WIRE ROPE

A. OPERATION

To obtain maximum service from any wire rope, it is important that equipment be well maintained in good working order and reeved with the correct rope that has been properly installed. Another major point sometimes overlooked, the operator must have the necessary skills and exercise reasonable care.

Modern designs of many types of equipment have incorporated electronic refinements into controls governing the speeds and loads imposed upon wire rope. Even with these refinements, final adjustments must be made by skilled technicians responsible for maintaining the equipment in proper working order. Rope life can be dependent, to a great extent, upon their knowledge and ability to adjust the controls so as to couple maximum production with good, safe rope life.

In many cases operation of the rope is still controlled directly by the operator. Experience and sense of touch, gained through his ability and close association with the equipment, can determine whether or not the rope service will be satisfactory.

The amount of service provided by a wire rope is influenced by the care afforded that rope. A rope subjected to high impact stresses, excessive vibrarion, continual overloads, abrasion or any other damaging conditions cannot be expected to last as long as one used properly by skilled operators.

LUBRICATION

Wire ropes are lubricated during fabrication, the amount and grade of lubricant used in general is dependent upon the size and type of rope. As this initial lubricant is not sufficient to last the entire useful life of the rope, subsequent applications of the following types of lubricants should be made periodically.

AIR SYSTEM

See air piping schematic diagram for operating pressure of compressor. The pressure switch is set at the factory to cut in and cut out at the required pressure. If resetting is necessary follow manufacturer's nameplate instructions. See schematic for pressure release setting of safety valve.

The compressor motor is controlled by a switch mounted on the electrical control panel in the operator's cab.

The tank should be cleared of water at least once a day by opening the pet cock on the bottom of the tank and the pet cock under deck below the compressor until all the water in the tank has been blown out. See schematic for the line pressure regulating valve pressure setting. This valve setting should not be changed as the Airflex clutches are not designed to operate at a greater pressure.

The air system is provided with gauges located in the operator's cab, in the main line, and crowd clutch line. Before the shovel or dragline is placed in operation, the line gauge should be checked to see that there is adequate pressure in the tank to operate brakes and clutches.

A sudden drop of pressure should be promptly investigated as to cause. All lines, tank and compressor should be checked for leaks and repaired as soon as possible.

All brakes and clutches are controlled through use of magnet valves. Air is admitted to a brake or clutch by either energizing the proper magnet valve.

ANTI-FREEZER - Westinghouse Air Brake Co. B6-106.01

A. MAINTENANCE

Clean wicks with a non-inflammable solvent before freezing weather sets in. During freezing weather, keep alcohol level at maximum. The chamber has a capacity of approximately one quart. Before filling the Anti-Freezer, vent the line for the pressure line type and stop the compressor for the atmospheric type.

B. OPERATION

The wick carries the alcohol by capillary action into the air passage where it evaporates into the air stream which distributes the alcohol vapor to all parts of the system.

The rate of evaporation is changed in the atmospheric type by raising or lowering the control rod in the top of the Anti-Freezer. Lowering the control rod increases the rate of evaporation. With the control rod completely out, the evaporation is stopped.

Read Carefully.

Save Time, Avoid Service Calls.

INSTALLATION AND OPERATING INSTRUCTIONS

PENN 110 SERIES

Heavy Duty Pump and Air Compressor Controls

Read Carefully.

Save Time, Avoid Service Calls.

INSTRUCTIONS CONTAINED IN THIS FORM COVER ALL PENN 110 SERIES CONTROLS:

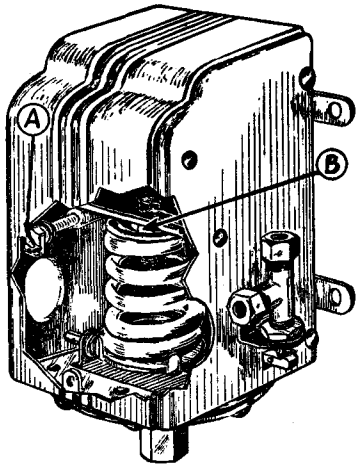

Fig. 1—Exterior View 110 Series with Built-in Magnetic Unloader.

APPLICATION: Penn 110 Series heavy duty pressure switches are automatic motor controls for use on water systems, air compressors and other pressure equipment. They open the circuit on rising pressure, close the circuit on falling pressure.

MOUNTING: Controls equipped with built-in magnetic unloader must be mounted in a vertical position with tapped opening in diaphragm chamber at bottom. All other types may be mounted either vertically or horizontally. Preferred mounting is vertical position by means of feet attached. NOTE: Controls may be supported directly by pipe line between receiver and tapped opening in diaphragm chamber, provided pipe line is short to insure that severe vibration will not affect pressure connections. On air compressor service, make sure that control is elevated enough that oil discharged from compressor will not drain into diaphragm.

RELEASE VALVES: Two-way Release Valve—For use on air compressor systems equipped with auxiliary tank or bleeding chamber. Purpose: (1)—To unload the compressor so that it starts against atmospheric pressure only, thus relieving the motor of heavy starting duty. (2)—To automatically drain off the condensation and oil from discharge side of compressor. Connect ¼" copper tubing from top of valve to auxiliary tank or bleeding chamber as shown in Fig. 2. Insert check valve between tank and bleeding chamber to prevent discharge of tank pressure. Side opening in valve is only for carrying discharged matter away. **Three-way Release Valve**—For use on air compressor systems where compressor is equipped with unloading device. Connect ¼" copper tubing from top of valve (see Fig. 3) to receiver. Connect side opening of valve to unloading device on compressor. Condensation and oil will drain through bottom (around valve operating plunger). IMPORTANT: Clean thoroughly all pipes and tubing leading to release valves before connecting. This prevents pipe scale, filings, metal chips, etc., from reaching valve.

VALVE SERVICE AIDS: If two-way valve (Fig. 2) leaks while compressor is running, it indicates that foreign matter is holding valve open. If leak occurs while compressor is idle, receiving tank check valve is faulty. Two-way valve seats only while compressor is running. **Three-way Valve** (Fig. 3) contains two internal valves that open and close alternately when compressor starts and stops. If continuous leak occurs while compressor is either running or idle, foreign matter is holding one of the valves open. To correct leaks due to foreign matter in release valve, disassemble and wash all parts in clean gasoline. Use extreme care not to injure valve seat or plunger. DO NOT ATTEMPT TO LAP VALVE SEATS.

WIRING: CAUTION: Controls equipped with magnetic unloader—Make sure magnetic coil is proper voltage and cycles for line on which installed. See Figures 4, 5, and 6.

IMPORTANT: FOLLOW WIRING CLOSELY FROM SELECTED DIAGRAM. DO NOT ALLOW WIRE LEADS TO INTERFERE WITH THE FREE MOVEMENT OF THE MOVABLE CONTACT BARS. VERY IMPORTANT: ALL POLYPHASE MOTORS SHOULD BE PROTECTED AGAINST SINGLE PHASING.

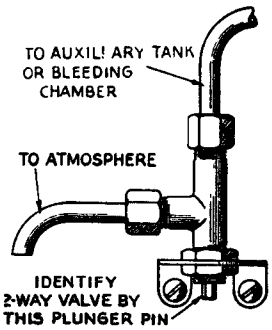

Fig. 2—Two-Way Valve Installation.

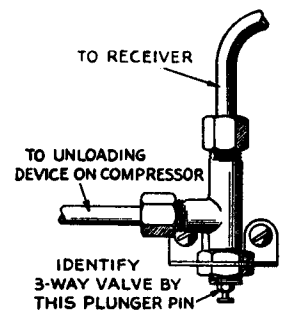

Fig. 3—Three-Way Valve Installation.

MAXIMUM ELECTRICAL RATING

See name plate label inside cover of switch.

SETTING: This control was set at factory as specified by buyer. To raise opening point, increase tension on range spring by turning adjusting nut "B" to right (clockwise) (Fig. 1). Closing point will be raised a corresponding amount. By decreasing tension on range spring, both opening and closing points will be lowered a like amount.

DIFFERENTIAL: CONSULT CHART BELOW WHEN MAKING DIFFERENTIAL ADJUSTMENTS. DO NOT ADJUST DIFFERENTIAL CLOSER THAN MINIMUM SPECIFIED. Differential (difference between opening and closing points) set at factory as specified by buyer. To widen differential, turn adjusting screw "A" to right (clockwise) (Fig. 1). Turn screw "A" to left (counterclockwise) to make differential closer. NOTE: When differential is widened, the opening point is raised and the closing point is lowered. Conversely, when differential is narrowed, the opening point is lowered and the closing point is raised.

IF DIFFERENTIAL ADJUSTMENTS ARE SET CLOSER THAN MINIMUM LISTED BELOW, SNAP ACTION OF THE CONTACTS WILL BE IMPAIRED. ALSO, ON TYPES EQUIPPED WITH MECHANICALLY OPERATED PRESSURE RELEASE VALVE, VALVE WILL NOT FUNCTION PROPERLY.

Type	Pressure Range (lbs.)	Release Valve	Differential (Any Setting) Min. (lbs.)	Max. (lbs.)
110BP01	10 to 185	None	15	34
110CP01	10 to 250		35	59
110BP02	10 to 185	2-Way	15	34
110CP02	10 to 250		35	59
110BP03	10 to 185	3-Way	20	25
110CP03	10 to 250		40	50
110BP02M	10 to 185	2-Way	15	25
110CP02M	10 to 250		25	50
110BP03M	10 to 185	3-Way	15	25
110CP03M	10 to 250		25	50